8.5 Noise

8.5.1 Introduction

The City of Vernon (City) proposes to develop a power plant (VPP) on a 13.7-acre property at the southeast corner of Fruitland and Boyle avenues. The VPP will be a 914-megawatt (MW) net (at 65 degrees Fahrenheit [°F] with duct burners and evaporative cooling)/943-MW (gross) combined-cycle generating facility configured using three natural-gas-fired combustion turbines and one steam turbine. Two transmission line options are being considered to connect the plant to Southern California Edison's (SCE) Laguna Bell Substation. Natural gas for the facility will be delivered via approximately 2,300 feet of new 24-inch pipeline that will connect to Southern California Gas Company's (SoCalGas) existing gas transmission line (Line 765). Potable water for drinking, safety showers, fire protection, service water, and sanitary uses will be served from the City's potable water system through two 10-inch pipelines connecting to the City's water mains. One would connect in Boyle Avenue and the other in Fruitland Avenue. Recycled water for industrial purposes will be provided by the Central Basin Municipal Water District (CBMWD) through a nominal 16-inch carbon steel (or if using high density polyethylene [HDPE], a 20-inch) water line connecting to its recycled water line in Boyle Avenue, adjacent to the plant site. The blowdown will be sent to Sanitation Districts of Los Angeles County (LACSD) via a new 2,400-foot section of City sanitary sewer line.

This section presents an assessment of potential noise impacts resulting from construction and operation of the proposed VPP. The project site is located in the City of Vernon. Generally, the design basis for noise control is the minimum, or most stringent, noise level required by any of the applicable laws, ordinances, regulations, or standards (LORS), which are described below. Therefore, noise from this project is evaluated against the City of Vernon's noise requirements. To assist the reader, this subsection presents a brief explanation of the fundamentals of acoustics. It describes the affected environment and the environmental consequences (i.e., the potential project effects from both construction and operation). Mitigation measures to reduce potential project impacts below the level of significance are proposed. The involved agencies and agency contacts are also listed.

8.5.2 Fundamentals of Acoustics

Acoustics is the study of sound, and noise is defined as unwanted sound. Airborne sound is a rapid fluctuation or oscillation of air pressure above and below atmospheric pressure creating a sound wave. Acoustical terms used in this subsection are summarized in Table 8.5-1.

TABLE 8.5-1
Definitions of Acoustical Terms

Term	Definition
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise or sound at a given location. The ambient level is typically defined by the L_{eq} level.
Background Noise Level	The underlying ever-present lower level noise that remains in the absence of intrusive or intermittent sounds. Distant sources, such as traffic, typically makeup the background. The background level is generally defined by the L_{90} percentile noise level.

TABLE 8.5-1
Definitions of Acoustical Terms

Term	Definition
Intrusive	Noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, time of occurrence, tonal content, the prevailing ambient noise level as well as the sensitivity of the receiver. The intrusive level is generally defined by the L_{10} percentile noise level.
Decibel (dB)	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
A-Weighted Sound Level (dBA)	The sound level in decibels as measured on a sound level meter using the A-weighted filter network. The A-weighted filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted.
Equivalent Noise Level (L_{eq})	The average A-weighted noise level, on an equal energy basis, during the measurement period.
Percentile Noise Level (L_n)	The noise level exceeded during n percent of the measurement period, where n is a number between 0 and 100 (e.g., L_{90})
Community Noise Equivalent Level (CNEL)	The energy average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels from 7:00 p.m. to 10:00 p.m. and 10 decibels from 10:00 p.m. to 7:00 a.m.

The most common metric is the overall A-weighted sound level measurement that has been adopted by regulatory bodies worldwide. The A-weighting network measures sound in a similar fashion to how a person perceives or hears sound, thus achieving very good correlation in terms of how to evaluate acceptable and unacceptable sound levels.

A-weighted sound levels are typically measured or presented as equivalent sound pressure level (L_{eq}), which is defined as the average noise level, on an equal energy basis for a stated period of time, and is commonly used to measure steady state sound or noise that is usually dominant. Statistical methods are used to capture the dynamics of a changing acoustical environment. Statistical measurements are typically denoted by $L_{xx,}$ where xx represents the percentile of time the sound level is exceeded. The L_{90} is a measurement that represents the noise level that is exceeded during 90 percent of the measurement period. Similarly, the L_{10} represents the noise level exceeded for 10 percent of the measurement period.

Another metric used in determining the impact of environmental noise is the differences in response that people have to daytime and nighttime noise levels. During the evening and nighttime, exterior background noises are generally lower than the daytime levels. However, most household noise also decreases at night and exterior noise becomes more noticeable. Furthermore, most people sleep at night and are sensitive to intrusive noises. To account for human sensitivity to evening and nighttime noise levels, the Community Noise Equivalent Level (CNEL) was developed. The CNEL is a noise index that accounts for the greater annoyance of noise during the evening and nighttime hours.

CNEL values are calculated by averaging hourly L_{eq} sound levels for a 24-hour period, and apply weighting factors to evening and nighttime L_{eq} values. The weighting factor, which reflects the increased sensitivity to noise during nighttime hours, is added to each hourly L_{eq} sound level before the 24-hour CNEL is calculated. For the purposes of assessing noise, the 24-hour day is divided into three time periods, with the following weightings:

- Daytime: 7 a.m. to 7 p.m. (12 hours) Weighting factor of 0 dB
- Evening: 7 p.m. to 10 p.m. (3 hours) Weighting factor of 3 dB
- Nighttime: 10 p.m. to 7 a.m. (9 hours) Weighting factor of 10 dB

The three time periods are then averaged (on an energy basis) to compute the overall CNEL value. For a continuous noise source, the CNEL value is easily computed by adding 6.7 dB to the overall 24-hour noise level (L_{eq}). For example, if the expected continuous noise level from the power plant was 60.0 dBA, the resulting CNEL from the plant would be 66.7 dBA.

The effects of noise on people can be listed in three general categories:

- Subjective effects of annoyance, nuisance, dissatisfaction
- Interference with activities such as speech, sleep, learning
- Physiological effects such as startling and hearing loss

In most cases, environmental noise produces effects in the first two categories only. However, workers in industrial plants typically experience noise effects in the last category. No completely satisfactory way exists to measure the subjective effects of noise, or to measure the corresponding reactions of annoyance and dissatisfaction. This lack of a common standard is primarily due to the wide variation in individual thresholds of annoyance and habituation to noise. Thus, an important way of determining a person's subjective reaction to a new noise is by comparing it to the existing or "ambient" environment to which that person has adapted. In general, the more the level or the tonal (frequency) variations of a noise exceed the previously existing ambient noise level or tonal quality, the less acceptable the new noise will be, as judged by the exposed individual.

Table 8.5-2 shows the relative A-weighted noise levels of common sounds measured in the environment and in industry for various sound levels.

TABLE 8.5-2
Typical Sound Levels Measured in the Environment and Industry

Noise Source at a Given Distance	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Impression
Shotgun (at shooter's ear)	140	Carrier flight deck	Painfully loud
Civil defense siren (100 ft)	130		
Jet takeoff (200 ft)	120		Threshold of pain
Loud rock music	110	Rock music concert	
Pile driver (50 ft)	100		Very loud
Ambulance siren (100 ft)	90	Boiler room	
Pneumatic drill (50 ft)	80	Noisy restaurant	
Busy traffic; hair dryer	70		Moderately loud
Normal conversation (5 ft)	60	Data processing center	

TABLE 8.5-2
Typical Sound Levels Measured in the Environment and Industry

Noise Source at a Given Distance	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Impression
Light traffic (100 ft); rainfall	50	Private business office	
Bird calls (distant)	40	Average living room library	Quiet
Soft whisper (5 ft); rustling leaves	30	Quiet bedroom	
	20	Recording studio	
Normal breathing	10		Threshold of hearing

Source: Beranek, 1998.

8.5.3 Laws, Ordinances, Regulations, and Standards

The following are the LORS that apply to noise generated by the project. They are summarized in Table 8.5-3 below.

TABLE 8.5-3
Applicable Laws, Ordinances, Regulations, and Standards

LORS	Purpose	Applicability (AFC Section Explaining Conformance)
Federal Offsite:		
USEPA	Guidelines for state and local governments.	Subsection 8.5.3.1.1.
Federal Onsite:		
OSHA	Exposure of workers over 8-hour shift limited to 90 dBA.	Subsections 8.5.3.1.2, 8.5.5.2.1, and 8.5.5.3.1. Also see Subsection 8.7, Worker Safety
State Onsite:		
Cal/OSHA 8 CCR Article 105 Sections 095 et seq.	Exposure of workers over 8-hour shift limited to 90 dBA.	Subsections 8.5.3.2.1, 8.5.5.2.1, and 8.5.5.3.1. Also see Subsection 8.7, Worker Safety
State Offsite:		
Calif. Vehicle Code Sections 23130 and 23130.5	Regulates vehicle noise limits on California highways.	Delivery trucks and other vehicles will meet Code requirements.
Local		
California Government Code Section 65302	Requires local government to prepare plans that contain noise provisions.	City of Vernon, Subsection 8.5.3.3.
City of Vernon	Establishes a threshold for property line noise levels and acceptable CNEL noise levels for various land use categories.	Subsections 8.5.3.3 and 8.5.5.3.4.

8.5.3.1 Federal

8.5.3.1.1 USEPA

Guidelines are available from the USEPA (1974) to assist state and local government entities in development of state and local LORS for noise. Because there are local LORS that apply to this project, the USEPA guidelines are not applicable.

8.5.3.1.2 OSHA

Onsite noise levels are regulated, in a sense, through the Occupational Safety and Health Act of 1970 (OSHA). The noise exposure level of workers is regulated at 90 dBA, over an 8-hour work shift to protect hearing (29 Code of Federal Regulations [CFR] 1910.95). Onsite noise levels will generally be in the 70- to 85-dBA range. Areas above 85 dBA will be posted as high noise level areas and hearing protection will be required. The power plant will implement a hearing conservation program for applicable employees and maintain exposure levels below 90 dBA.

8.5.3.2 State of California

8.5.3.2.1 Cal-OSHA

The California Department of Industrial Relations, Division of Occupational Safety and Health enforces California Occupational Safety and Health Administration (Cal-OSHA) regulations, which are the same as the federal OSHA regulations described previously. The regulations are contained in Title 8 of the California Code of Regulations (CCR), General Industrial Safety Orders, Article 105, Control of Noise Exposure, Sections 5095, et seq.

8.5.3.2.2 California Vehicle Code

Noise limits for highway vehicles are regulated under the California Vehicle Code, Sections 23130 and 23130.5. The limits are enforceable on the highways by the California Highway Patrol and the County Sheriff's Office.

8.5.3.3 Local

The California State Planning Law (California Government Code Section 65302) requires that all cities, counties, and entities (such as multi-city port authorities) prepare and adopt a General Plan to guide community change. Because the project is located within the City of Vernon, only the City of Vernon has jurisdiction over the project. The noise requirements of neighboring jurisdictions are only presented to ensure the application is considered data adequate.

8.5.3.3.1 City of Vernon

The City of Vernon's 1989 General Plan Land Use Element states that land uses that produce noise in excess of 70 dBA at the property line may be permitted with a Conditional Use Permit. The City has previously determined that City projects, such as the Vernon Power Plant (VPP) do not require a Conditional Use Permit.

If a new noise sensitive use (e.g., residential, hotel, hospital, etc.) was to be established within the City of Vernon, that use would have to mitigate the impacts of existing noise sources. New noise sensitive uses located in areas where the existing noise exceeds 60 dBA CNEL would require a noise mitigation analysis.

For new projects or developments that will emit noise, the city uses the Land Use Noise Compatibility matrix contained in the General Plan to determine if mitigation is required. This matrix is reproduced in Table 8.5-4. All projects must mitigate noise to a "compatible" level at the receiving property line. Therefore, the threshold for a significant impact on a residential use would be an exterior level of 70 dBA CNEL. This is equivalent to a steady-state noise level from VPP of approximately 63 dBA.

TABLE 8-5-4
City of Vernon Land Use Noise Compatibility Matrix

Land Use Categories		Community Noise Equivalent Level (CNEL)						
Categories	**Uses**	**<55**	**60**	**65**	**70**	**75**	**80>**	
Residential	Single family, duplex, multiple family	A	A	B	B	C	D	D
Residential	Mobile home	A	A	B	C	C	D	D
Commercial Regional, District	Hotel, motel, transient lodging	A	A	B	B	C	C	D
Commercial Regional, Village District, Special	Commercial retail, bank, restaurant, movie theatre	A	A	A	A	B	B	C
Commercial Industrial Institutional	Office building, research and development, professional offices, city office building	A	A	A	B	B	C	D
Commercial Recreation	Amphitheater, concert hall	B	B	C	C	D	D	D
Institutional Civil Center	Auditorium, meeting hall	B	B	C	C	D	D	D
Commercial Recreation	Children's' amusement park, miniature golf course, go-cart track, equestrian center, sports club	A	A	A	B	B	D	D
Commercial General, Special Industrial, Institutional	Automobile service station, auto dealership, manufacturing, warehousing, wholesale, utilities	A	A	A	A	B	B	B
Institutional General	Hospital, church, library, school classroom	A	A	B	C	C	D	D
Open Space	Parks	A	A	A	B	C	D	D
Open Space	Golf course, cemeteries, nature centers, wildlife reserves, wildlife habitat	A	A	A	A	B	C	C
Agriculture	Agriculture	A	A	A	A	A	A	A

Interpretation:

Zone A
Clearly Compatible
Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction without any special noise intrusion requirements.

Zone B
Normally Compatible
New construction or development should be undertaken only after detailed analysis of the noise reduction requirements are made and needed noise insulation features in the design are determined. Conventional construction, with closed windows and fresh air supply systems or air conditioning, will normally suffice.

Zone C
Normally Incompatible
New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of noise reduction requirements must be made and needed noise insulation features included in the design.

Zone D
Clearly Incompatible
New construction or development should generally not be undertaken.

Source: Table N-1, City of Vernon General Plan, Noise Element.

8.5.4 Affected Environment

The project site is located in the City of Vernon, in Los Angeles County, California. The land use to the north, south, west, and east of the VPP project site is industrial**.** Six residences are located northeast of the site on the north side of Fruitland Avenue west of Downey Road. They are owned by the City of Vernon and rented to City employees.

The site consists of 13.7 acres in the southeastern part of the City near the intersection of Boyle and Fruitland Avenues. Under a purchase agreement between the City of Vernon and the property owner, the property owner will be responsible to remove all existing buildings and structures before transferring ownership to the City.

The City General Plan land use designation for the project site is General Industrial (see Section 8.4, Land Use, Figure 8.4-1). The General Plan Industrial designation allows manufacturing, assembling, and wholesaling uses. In addition, hazardous waste processors, trash to energy facilities, and solid and liquid waste disposal facilities are permitted if a conditional use permit (CUP) is issued. The Zoning Ordinance designation for the project site is General Industrial (M**).** The following uses are permitted uses in the General Industrial (M) zone: (1) industry; (2) residential dwelling, single family or independent living facility; (3) residential unit-temporary; (4) public facilities; (5) retail and commercial uses; (6) warehouses; (7) refrigerated warehouses; (8) vehicle sales, fabrication or repair facility, and (9) general offices.

Sources of environmental noise in the project area include the numerous industrial operations and significant heavy truck traffic on local roads. Noise from industrial activities occurs on a 24-hour basis.

8.5.4.1 Ambient Noise Survey

The ambient noise survey results for this project were drawn from two primary sources: (1) on-site measurements conducted specifically for this project and (2) compliance measurements conducted for the City of Vernon's Malburg Generating Station. All monitoring locations are shown in Figure 8.5-1. Monitoring locations R1 and R3 were collected for the Malburg Generating Station, but are not included in this section given their distance from the VPP site. The three monitoring locations considered representative of the VPP project area are: (R2) depicts the location of an apartment that is above the La Villa Basque Restaurant and the closest receptor to the Malburg Generating Station (MGS) project; (R4) is a parking lot located behind industrial buildings off Bickett Avenue; (R5) is behind the six residences located on the north side of Fruitland Avenue west of Downey road.

Measurements at R2 were conducted on January 5 and 6, 2006, by Parsons to satisfy the Conditions of Certification for the MGS. The MGS was operating at 100 percent load during daytime hours (6 a.m. to 6 p.m.), and 80 percent load during evening and nighttime hours (6 p.m. to 6 a.m.). The sound level meters were field calibrated before and after the measurement with a Larson Davis CAL250. All equipment was ANSI Type 1 (precision) and was factory calibrated within the previous 12 months. Clear skies and winds generally between 0 to 5 mph with brief periods up to 10 mph persisted throughout most of the measurement duration. Daytime temperatures were approximately 80°F.

Results at R4 and R5, conducted on September 13 and 14, 2005, indicate generally high levels of noise throughout the area. Sound level meters deployed at locations R4 and R5 were Larson Davis 820s. The sound level meters were field calibrated before and after the measurement with a Larson Davis CAL200. All equipment was ANSI Type 1 (precision) and was factory calibrated within the previous 12 months. Clear skies and an occasional light breeze during the day (generally less than 10 mph at the microphone) persisted throughout most of the measurement period. Daytime temperatures were approximately 70°F. There were intermittent construction activities during the day near location R4. Location R5 is shielded from roadway and industrial noise from the large neighboring buildings. This location was selected because it was relatively secure and hidden from view—reducing the likelihood that the equipment would be tampered with—although it is acoustically shielded from many of the existing noise sources.

Tables 8.5-5 through 8.5-7 present the monitoring results. At location R2, the residences on the corner of Leonis Boulevard and Soto Street, the nighttime L_{90} is approximately 58 dBA and the CNEL is 68 dBA. These two streets are the dominant noise sources at this location during daytime hours.

TABLE 8.5-5
Summary of Hourly Measurements at R2 (dBA)

Date and Time	L_{eq}	L_{90}
1/5/06 10:00 AM	63	60
1/5/06 11:00 AM	63	60
1/5/06 12:00 PM	64	60
1/5/06 01:00 PM	66	60
1/5/06 02:00 PM	63	60
1/5/06 03:00 PM	63	59
1/5/06 04:00 PM	64	60
1/5/06 05:00 PM	63	60
1/5/06 06:00 PM	62	59
1/5/06 07:00 PM	61	59
1/5/06 08:00 PM	61	58
1/5/06 09:00 PM	61	59
1/5/06 10:00 PM	61	58
1/5/06 11:00 PM	60	58
1/6/06 12:00 AM	60	58
1/6/06 1:00 AM	60	58
1/6/06 2:00 AM	60	58
1/6/06 3:00 AM	60	58
1/6/06 4:00 AM	61	59

TABLE 8.5-5
Summary of Hourly Measurements at R2 (dBA)

Date and Time	L_{eq}	L_{90}
1/6/06 5:00 AM	63	60
1/6/06 6:00 AM	64	61
1/6/06 7:00 AM	64	62
1/6/06 8:00 AM	65	62
1/6/06 9:00 AM	64	61
1/6/06 10:00 AM	64	60
1/6/06 11:00 AM	63	60
1/6/06 12:00 PM	63	60
1/6/06 1:00 PM	63	60
1/6/06 2:00 PM	63	60
1/6/06 3:00 PM	63	61
1/6/06 4:00 PM	63	60
1/6/06 5:00 PM	63	61

Source: Parsons, 2006.

TABLE 8.5-6
Summary of Hourly Measurements at R4 (dBA)

Date and Time	L_{eq}	L_{10}	L_{50}	L_{90}
9/13/05 2:31 PM	62	59	53	50
9/13/05 3:00 PM	56	57	52	50
9/13/05 4:00 PM	57	58	53	50
9/13/05 5:00 PM	55	56	51	48
9/13/05 6:00 PM	55	57	53	50
9/13/05 7:00 PM	57	59	52	49
9/13/05 8:00 PM	54	57	51	48
9/13/05 9:00 PM	56	58	50	46
9/13/05 10:00 PM	63	64	52	45
9/13/05 11:00 PM	55	50	45	43
9/14/05 12:00 AM	56	51	45	43
9/14/05 1:00 AM	47	46	44	43
9/14/05 2:00 AM	44	45	43	42
9/14/05 3:00 AM	49	50	45	44

TABLE 8.5-6
Summary of Hourly Measurements at R4 (dBA)

Date and Time	L_{eq}	L_{10}	L_{50}	L_{90}
9/14/05 4:00 AM	47	48	46	45
9/14/05 5:00 AM	49	50	48	46
9/14/05 6:00 AM	53	53	49	46
9/14/05 7:00 AM	59	61	53	49
9/14/05 8:00 AM	55	57	54	50
9/14/05 9:00 AM	54	56	53	50
9/14/05 10:00 AM	54	56	52	50
9/14/05 11:00 AM	55	57	53	50
9/14/05 12:00 PM	49	50	49	47

Source: CH2M HILL.

TABLE 8.5-7
Summary of Hourly Measurements at R5 (dBA)

Date and Time	L_{eq}	L_{10}	L_{50}	L_{90}
9/13/05 1:32 PM	59	61	57	54
9/13/05 2:00 PM	61	62	58	55
9/13/05 3:00 PM	67	70	60	56
9/13/05 4:00 PM	60	63	57	54
9/13/05 5:00 PM	58	61	56	53
9/13/05 6:00 PM	57	59	56	53
9/13/05 7:00 PM	59	60	55	53
9/13/05 8:00 PM	56	59	54	53
9/13/05 9:00 PM	56	57	53	52
9/13/05 10:00 PM	56	58	53	52
9/13/05 11:00 PM	57	57	53	52
9/14/05 12:00 AM	55	56	53	52
9/14/05 1:00 AM	54	54	53	52
9/14/05 2:00 AM	53	54	53	52
9/14/05 3:00 AM	54	55	53	51
9/14/05 4:00 AM	55	57	54	52
9/14/05 5:00 AM	56	59	54	52
9/14/05 6:00 AM	58	61	56	53

TABLE 8.5-7
Summary of Hourly Measurements at R5 (dBA)

Date and Time	L_{eq}	L_{10}	L_{50}	L_{90}
9/14/05 7:00 AM	63	62	57	54
9/14/05 8:00 AM	59	62	57	54
9/14/05 9:00 AM	63	64	58	54
9/14/05 10:00 AM	64	66	59	55
9/14/05 11:00 AM	60	63	57	54
9/14/05 12:00 PM	58	61	56	53
9/14/05 1:00 PM	59	62	57	53

Source: CH2M HILL.

At location R4, which is heavily shielded, the nighttime L_{90} is approximately 44 dBA and the CNEL is 62 dBA. The measurements at location R5 show steady levels in mid to high 50s dBA, the resulting CNEL is 64 dBA. Observations made around midnight indicate noise levels similar to those reported for R5, and are pervasive along Downey Road, Slauson Avenue, and the portion of Fruitland Avenue that extends into the City of Maywood. The sources of nighttime noise near location R5 included nearby refrigerated warehouses and large air handling equipment/cyclones on the opposite side of Downey Road associated with the General Mills facilities, in addition to some traffic on Downey Road and Fruitland Avenue. The nighttime L_{90} is approximately 52 dBA.

8.5.5 Environmental Consequences

The proposed VPP will produce noticeable noise during operations, but the noise levels will be in compliance with City of Vernon's requirements for industrial properties. Noise will also be produced at the site during the construction phase of the project. Potential noise impacts from construction and operation activities are assessed in this subsection.

8.5.5.1 Significance Criteria

The City has established quantitative standards for determining appropriate noise levels for various land use categories. These standards are summarized in Table 8.5-4. Noise impacts may be considered significant if project operational activities conflict with the Noise Level Limits by land use category summarized in Table 8.5-4, specifically 70 dBA CNEL at residential receptors. A steady noise level at a residential receptor of 63 dBA generated by VPP would be equivalent to 70 dBA CNEL.

In addition to the City criteria, the Energy Commission Staff concluded that a potential for a significance noise impact exists where the noise of the project exceeds the background noise by 5 dBA or more (CEC, 2002). It is important to note that the potential for an impact does not mean that there is an impact. Rather, it means that the project noise levels need further evaluation. The Energy Commission staff has also concluded that construction noise is typically insignificant if: (1) the construction activity is temporary; (2) use of heavy equipment and noisy activities is limited to daytime hours; and (3) all feasible noise abatement measures are implemented for noise-producing equipment (CEC, 2002).

8.5.5.2 Construction Impacts

This subsection addresses the various components of construction noise and vibration.

8.5.5.2.1 Worker Exposure to Noise

Worker exposure levels during construction of the VPP will vary depending on the phase of the project and the proximity of the workers to the noise-generating activities. Hearing protection will be available for workers and visitors to use as needed throughout the duration of the construction period. A Hearing Protection Plan, which complies with Cal-OSHA requirements, will be incorporated into the Health and Safety Plan.

8.5.5.2.2 Plant Construction Noise

Construction of the VPP is expected to be typical of other power plants in terms of schedule, equipment used, and other types of activities. The noise level will vary during the construction period, depending upon the construction phase. Construction of power plants can generally be divided into five phases that use different types of construction equipment. The five phases are: (1) demolition, site preparation, and excavation; (2) concrete pouring; (3) steel erection; (4) mechanical; and (5) clean-up (Miller et al., 1978).

Both the USEPA Office of Noise Abatement and Control and the Empire State Electric Energy Research Company have extensively studied noise from individual pieces of construction equipment as well as from construction sites of power plants and other types of facilities (USEPA, 1971; Barnes et al., 1976). Since specific information on types, quantities, and operating schedules of construction equipment is not available at this point in project development, information from these documents for similarly sized industrial projects will be used. Use of this data, which is between 21 and 26 years old, is conservative since the evolution of construction equipment has been toward quieter designs to protect operators from exposure to high noise levels.

The loudest equipment types generally operating at a site during each phase of construction are presented in Table 8.5-8. The composite average or equivalent site noise level, representing noise from all equipment, is also presented in the table for each phase.

TABLE 8.5-8
Construction Equipment and Composite Site Noise Levels

Construction Phase	Loudest Construction Equipment	Equipment Noise Level (dBA) at 50 feet	Composite Site Noise Level (dBA) at 50 feet
Demolition, Site Clearing, and Excavation	Dump truck Backhoe	91 85	89
Concrete Pouring	Truck Concrete mixer	91 85	78
Steel Erection	Derrick crane Jack hammer	88 88	87
Mechanical	Derrick crane Pneumatic tools	88 86	87
Cleanup	Rock drill Truck	98 91	89

Source: USEPA, 1971; Barnes et al., 1976.

Average or equivalent construction noise levels projected at various distances from the site are presented in Table 8.5-9. These results are conservative since the only attenuating mechanism considered was divergence of the sound waves in open air. Shielding effects of intervening structures are not included in the calculations. The construction noise may be audible at the nearest residences the closest of which is about 1,000 feet away but is not anticipated to exceed current exposure levels (with the exception of pile driving) and the noisiest construction activities will be confined to the daytime hours. Table 8.5-10 presents noise levels from common construction equipment at various distances. (Please note that demolition will not occur at the site as part of this project).

TABLE 8.5-9
Average Construction Noise Levels at Various Distances

Construction Phase	Sound Pressure Level (dBA)		
	375 feet	1,500 feet	3,000 feet
Demolition, Site Clearing, and Excavation	71	59	53
Concrete Pouring	60	48	42
Steel Erection	69	57	51
Mechanical	69	57	51
Clean-Up	71	59	53

TABLE 8.5-10
Noise Levels from Common Construction Equipment at Various Distances

Construction Equipment	Typical Sound Pressure Level (dBA)		
	50 feet	375 feet	1,500 feet
Pile drivers (20,000-32,000 ft-lbs./blow)	104	86	74
Dozer (250-700 hp)	88	70	58
Front end loader (6-15 cu. yds.)	88	70	58
Trucks (200-400 hp)	86	68	56
Grader (13 to 16 ft. blade)	85	67	55
Shovels (2-5 cu. yds.)	84	66	54
Portable generators (50-200 kW)	84	66	54
Derrick crane (11-20 tons)	83	65	53
Mobile crane (11-20 tons)	83	65	53
Concrete pumps (30-150 cu. yds.)	81	63	51
Tractor (3/4 to 2 cu. yds.)	80	62	50
Unquieted paving breaker	80	62	50
Quieted paving breaker	73	55	43

Noise generated during the testing and commissioning phase of the project is not expected to be substantially different from that produced during normal full-load operation. Starts and abrupt stops are more frequent during this period, but on the whole they are usually short-lived. Because of the industrial nature of the area, e steam blows may not be limited to daytime work hours. A silencer or low pressure blows will be employed to ensure that steam blows do not exceed 70 dBA during the day and 60 dBA during the night at the nearest residences (R5). Such levels are consistent with the City LORS of 70 dBA CNEL.

8.5.5.2.3 Construction Vibration

Construction vibrations can be divided into three classes, based on the wave form and its source:

Wave form: Impact	Example source: impact pile driver or blasting
Wave form: Steady state	Example source: vibratory pile driver
Wave form: Pseudo steady state	Example source: double acting pile hammer

Pile driving is currently anticipated and will be limited to daytime work hours.

8.5.5.3 Operational Impacts

This subsection describes the expected noise impacts from operation of the plant.

8.5.5.3.1 Worker Exposure to Operational Noise

Nearly all components will be specified not to exceed near-field maximum noise levels of 90 dBA at 3 feet (or 85 dBA at 3 feet where available as a vendor standard). Since there are no permanent or semi-permanent workstations located near any piece of noisy plant equipment, no worker's time-weighted average exposure to noise should approach the level allowable under OSHA guidelines. Nevertheless, signs requiring the use of hearing protection devices will be posted in all areas where noise levels commonly exceed 85 dBA, such as inside acoustical enclosures. Outdoor levels throughout the plant will typically range from 90 dBA near certain equipment to roughly 65 dBA in areas more distant from any major noise source.

8.5.5.3.2 Plant Operation Noise Levels

A noise model of the proposed VPP facility has been developed using source input levels derived from manufacturers' data and field surveys of similar equipment. The noise levels generated by the plant have been calculated for the monitoring locations. R5 is the only monitoring location representing a residential area near the VPP and is located approximately 1,000 feet away. The noise levels presented represent the anticipated steady-state level from the plant with essentially all equipment operating.

Standard acoustical engineering methods were used in the noise analysis. The noise model, CADNA/A by DataKustik GmbH of Munich, Germany is a very sophisticated noise model and enables one to fully model very complex industrial plants. The sound propagation factors used in the model have been adopted from ISO 9613-2 *Acoustics – Sound Attenuation During Propagation Outdoors* and VDI 2714 *Outdoor Sound Propagation*. The model divides the proposed facility into a list of individual point and area noise sources representing each piece of equipment that produces a significant amount of noise. The sound power levels representing the standard performance of each of these components are assigned based

either on field measurements of similar equipment made at other existing plants, data supplied by manufacturers, or information found in the technical literature. Using these standard power levels as a basis, the model calculates the sound pressure level that would occur at each receptor from each source after losses from distance, air absorption, blockages, etc. are considered. The sum of all these individual levels is the total plant level at the modeling point.

The sound power levels, by octave band, used in the model are summarized in Table 8.5-11.

TABLE 8.5-11
Octave Band Sound Power Levels Used to Model VPP Operations, dB (Flat)

Plant Component	Octave Band Center Frequency, Hz									
	31.5	63	125	250	500	1k	2k	4k	8k	dBA
Heat recovery steam generator (HRSG)	132	125	121	115	110	104	101	99	80	113
HRSG Stack	121	120	121	118	114	103	87	89	74	114
Gas turbine	120	118	111	102	99	100	100	98	96	106
Cooling tower	119	117	113	108	107	105	103	100	96	111
Gas compressor	114	109	101	95	95	97	98	101	91	105
Generator step-up transformer	101	107	110	100	110	91	89	82	76	107
Steam turbine	111	118	121	116	108	108	107	106	101	115

Operational noise from the VPP is predicted not to exceed 59 dBA at R5, the residential noise monitoring location closest to the site as shown in Figure 8.5-1. This would result in a project only CNEL of 66 dBA, 2 dBA greater than the existing CNEL of 64 dBA and below City LORS of 70 dBA CNEL. During the nighttime hours, a project level of 59 dBA is 7 dBA greater than the average nighttime L_{90} and 6 dBA greater than the average nighttime L_{50}. While these levels exceed the CEC's 5 dBA threshold for a potential noise impact suggesting further analysis is warranted, they result in less than a 10 dBA increase. Such an increase should be considered acceptable given compliance with the City LORS, the industrial nature of the city, the limited number of affected residences, and the fact that the residences are owned by the City.

8.5.5.3.3 Tonal Noise

As a general rule, combined-cycle plants, even those without significant noise controls, do not produce discrete tones that are prominent or noticeable at typical receptor distances. At the monitoring locations modeled here, no significant tones are anticipated.

That is not to say that audible tones are impossible—certain sources within the plant such as the combustion turbine inlets, transformers, pump motors, cooling tower fan gearboxes, etc. have been known to sometimes produce significant tones. It is the Applicant's intention to anticipate the potential for audible tones in the design and specification of the plant's equipment and take necessary steps to prevent sources from emitting tones that might be disturbing at the nearest receptors.

8.5.5.3.4 Ground and Airborne Vibration

Similar combined-cycle facilities have not resulted in ground or airborne vibration impacts. The proposed project is primarily driven by gas turbines exhausting into heat recovery steam generators (HRSGs). These very large HRSGs reduce low frequency noise, which is mainly the source of airborne induced vibration of structures.

The equipment that would be used in the proposed project is well balanced and is designed to produce very low vibration levels throughout the life of the project. An imbalance could contribute to ground vibration levels in the vicinity of the equipment. However, vibration-monitoring systems installed in the equipment are designed to ensure that the equipment remains balanced. Should an imbalance occur, the event would be detected and the equipment would automatically shut down.

8.5.6 Mitigation Measures

The following mitigation measures are anticipated to be included in the project.

8.5.6.1 Noise Mitigation Measure #1

The project owner shall establish a telephone number for use by the public to report any significant undesirable noise conditions associated with the construction and operation of the project. If the telephone is not staffed 24 hours per day, the project owner shall include an automatic answering feature, with date and time stamp recording, to answer calls when the phone is unattended. This telephone number shall be posted at the project site during construction in a manner visible to passersby. This telephone number shall be maintained until the project has been operational for at least one year.

8.5.6.2 Noise Mitigation Measure #2

Throughout the construction and operation of the project, the project owner shall document, investigate, evaluate, and attempt to resolve all legitimate project related noise complaints.

The project owner or authorized agent shall:

- Use the Noise Complaint Resolution Form typically suggested by CEC or functionally equivalent procedure to document and respond to each noise complaint
- Attempt to contact the person(s) making the noise complaint within 24 hours
- Conduct an investigation to attempt to determine the source of noise related to the complaint
- If the noise complaint is legitimate, take all feasible measures to reduce the noise at its source

8.5.6.3 Noise Mitigation Measure #3

Noisy construction work (that causes offsite annoyance as evidenced by the filing of a legitimate noise complaint) shall be restricted to the 6:00 a.m. to 7:00 p.m. time period. Haul trucks shall be operated in accordance with posted speed limits. Truck engine exhaust brake use shall be limited to emergencies.

8.5.7 Involved Agencies and Agency Contacts

Agency contacts relative to noise issues are presented in Table 8.5-12.

TABLE 8.5-12
Involved Agencies and Agency Contacts

Agency	Contact/Title	Telephone
City of Vernon Community Service and Water Department 4305 Santa Fe Avenue Vernon, CA 90058 http://www.cityofvernon.org/	Kevin Wilson/Director of Community Services and Water	(323) 583-8811

8.5.8 Permits Required and Permit Schedule

No permits are required for noise; therefore, there is no permit schedule.

8.5.9 References

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Parsons. 2006. *Noise Measurement Results (revised) for Conditions of Certification of the Malburg Generating Station located in the City of Vernon, CA*. Submitted to the CEC February 2006.

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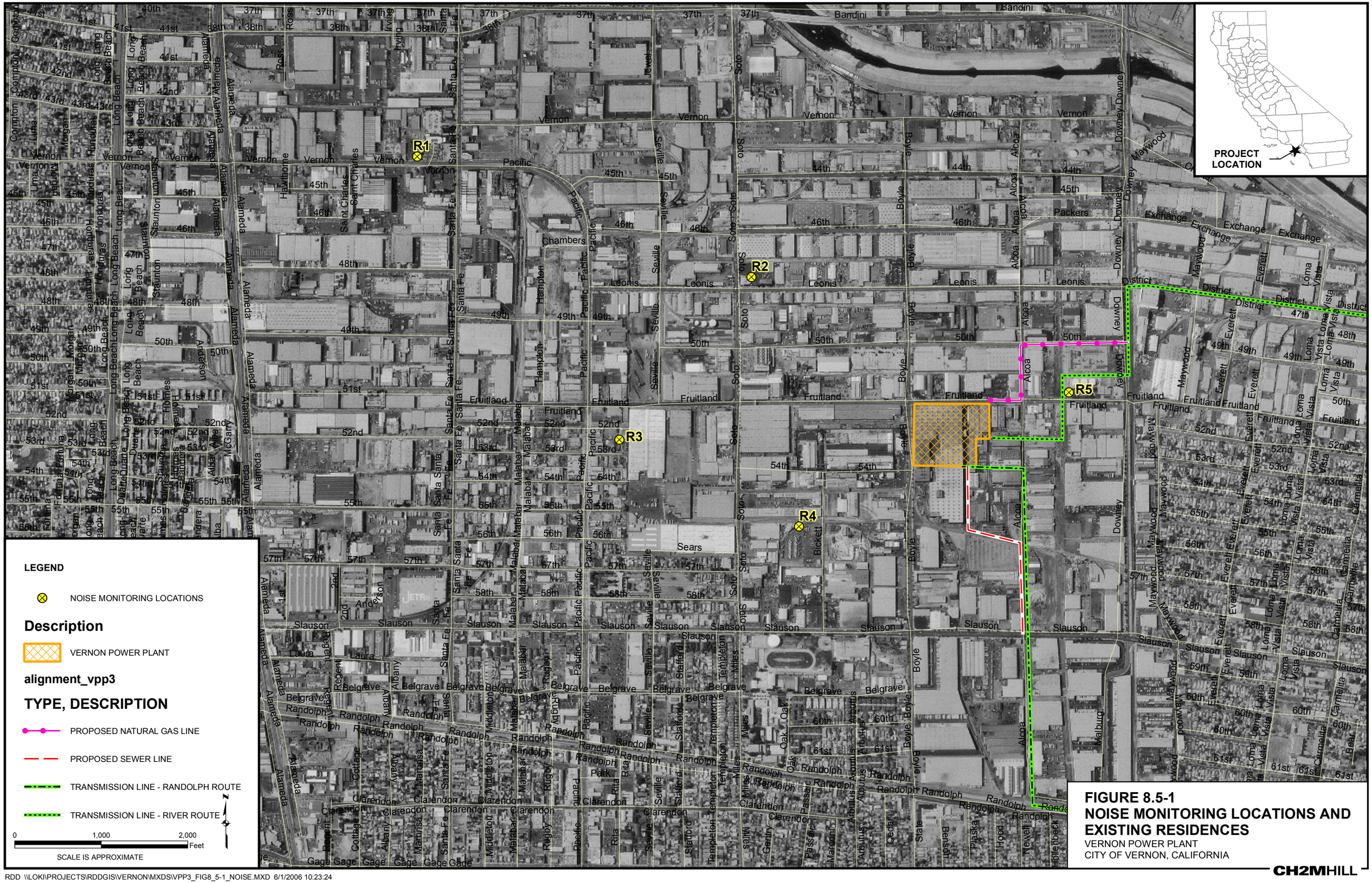

FIGURE 8.5-1
NOISE MONITORING LOCATIONS AND EXISTING RESIDENCES
VERNON POWER PLANT
CITY OF VERNON, CALIFORNIA

CH2MHILL

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